DOCUMENT RESUME

ED 229 999 EC 152 566

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TITLE With a Little Help from My Friend: Mastering Math Facts with Peer Tutoring.
PUB DATE Apr 83
NOTE 25p.; Paper presented at the Annual International Convention of The Council for Exceptional Children (61st, Detroit, MI, April 4-8, 1983).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; Behavior Change; Elementary Education; *Learning Disabilities; *Mathematics Instruction; Peer Relationship; *Peer Teaching; Program Descriptions; *Slow Learners; *Tutorial Programs

ABSTRACT

The paper presents a case study of a successful elementary school peer tutoring program for learning disabled and slow learning students (first to fourth grades) having difficulties with math facts. Ten tutors in third to sixth grades were selected as tutors and trained by the resource teacher to use such strategies as praise, correction, and charting of daily progress data. Agendas for 14 day training sessions are provided. Tutoring involved a flashcard drill followed by a time written worksheet of addition or subtraction facts. As a group, the students mastered an average of 9.1 sets of facts and both tutors and students reported satisfaction with the program. Relationships between tutors and students appeared to extend beyond the session. Inappropriate behavior in tutors decreased and tutors became more involved in school. (CL)

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NATIONAL COUNCIL FOR EXCEPTIONAL CHILDREN

WITH A LITTLE HELP FROM MY FRIEND:
MASTERING MATH FACTS WITH PEER TUTORING

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MARCH 1983

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Introduction

Because of the evidence that children with academic problems make the greatest gains when instructed individually, resource teachers are constantly looking for ways to provide more children with direct, individual instruction. One such method that has been used successfully and reported in the literature is the use of cross-age and peer tutors.

Jenkins (1974) compared the progress of students taught individually by a peer to that of students in a small group taught by a certified resource teacher and found that 97% of the students made more progress with a tutor. He also demonstrated that children made more progress working with a tutor than they did when given work to do independently. Howell and Kaplan (1978) found that peer tutors could be used to increase the oral reading rates of children who were tutored. Their study also emphasized the importance of adequate monitoring of the tutors. As part of their training in the Resource/Consulting Teacher program, graduate students at the University of Illinois are currently learning to use peer and cross-age tutors to provide direct instruction (Idol-Maestas, 1981).

The Fairview "Super-Tutor" program used cross-age tutors to work with students having trouble with math facts. The ten children who received help from a tutor ranged in age from first to fourth grades. Two of the students were identified as Learning Disabled. All of the students were recommended for help by their regular classroom teachers.

Ten students, ranging in age from third to sixth grades, participated as tutors. Two students were identified by their teachers as being "average" students with a history of some academic problems. Two others were selected for the tutoring program partly to improve their own social skills and behavior. The other tutors were identified as "top" students in their classes.

Hypotheses

The instructor developed three hypotheses: 1) Students receiving peer tutoring would perform written math facts with the speed and accuracy expected in their regular classes. Mastery was defined as working a written sheet of facts with at least 93% accuracy at a rate of at least twenty correct facts per minute (CFPM) on three consecutive trials. 2) Students labeled "learning disabled" would master the math facts as successfully as nonlabeled children did. 3) Students who were tutored would demonstrate more positive attitudes about their ability to succeed in school.

To test the first two hypotheses, daily data was recorded and charted for each student by his/her tutor. The charts were frequently reviewed and validated by the resource teacher. To assess the affective results of the program, the investigators used interviews and questionnaires which were given to the tutors and tutees at the end of the program.

Tutor Training

The tutors were trained in the resource room in small groups (approximately 4-5) working with the resource teacher. Two tutors were trained individually because of schedule conflicts. The training consisted of daily 25 minute sessions lasting about three weeks. Key skills that each tutor was required to master included the use of praise, the correction of flashcard errors and worksheet errors, the use of a digital stopwatch, computation of percentage and rate, and the charting of daily progress data. The schedule of training is outlined in the following pages.

Daily Outline for Tutor Training (Math Facts)

Day One

1. Orientation to tutoring
    a. what is it? what are the "tutees"?
    b. job description
    c. tutor responsibilities - must be here every day; scheduled "vacations" ok.
    d. emphasize confidentiality

2. Praise words
    a. group-generated list (exhibit one)
    b. assignment: have at least 3 tomorrow

3. Parent Permission forms (exhibit two)
    a. read together
    b. fill in name, date
    c. teacher signs
    d. take home and return w/parent's signature

handouts: Parent permission letters
"Welcome to Super Tutor Crew" (exhibit three)

Exhibit 1. Group Generated Praise Words.

Super Tutor Ways to Say "Good Job"

Better than ever
Very Good
Excellent
Tremendous
Splendid
Superior Job
Outstanding
Great
Hurray
Much Better
Spectacular
Fine
First Class
Good Job
Perfect
O.K.
Good for you
All right
Fantastic
Good
Brilliant
Nice Work
First Rate
Really nice
Way-to-Go
Sensational
Good Boy
Very Bright
Magnificent Mind
Getting better
I like your work
Keep up the hard work
You're doing excellent
Your are improving
You're doing better
This is the best I've seen you do
You did better than yesterday
You get better all the time

Extremely excellent
Well Done
Superior
Superb
Impressive
Good reading
Good girl
Super
Terrific
Doing fine
Fabulous
Marvelous
Well done
Super Good
Swell Job
Yeah
Astounding
Great work
Yippee
Excellent Work
Perfect Paper
I'm impressed
Wonderful
Doing Good
100% Correct
Nice Going
Good Job
Congratulations
Bright
Very Clever
You're getting smarter
Remarkable Magnificent
I like your speaking
Right-o-Daddy-o
I'm proud of you
Things are getting better all the time
I like the way you're reading
You are doing an excellent job

Exhibit 2. Parent Permission Letter.

Fairview School
Darien, Illinois

Dear Parent,

_____ has been chosen to be a Fairview tutor. Each tutor will work individually with one student in math. The tutoring will take about 30 minutes each day, and therefore the classroom teachers have only recommended as tutors those students who have proven that they can complete all daily classroom assignments without getting behind. _____ has also shown the social maturity required for working with another student who is having some learning difficulties.

We find that tutors often develop a strong sense of responsibility and seem to improve their own feelings of self-worth. The children being tutored are very happy to have the individual attention. With your permission, I will train _____ in the skills needed to help another student. This includes drilling on math flashcards, using a stop-watch, calculating percent correct and rate, and keeping careful records. All tutoring will be done under supervision. If you have any questions, please call me (969-6660). I look forward to working with _____.

Sincerely,

Peggy Bullard
Resource Teacher

- - - -

Exhibit 3. Welcome Notice for Tutors.

WELCOME TO THE FAIRVIEW "SUPER-TUTOR" CREW!

Always check the Tutor bulletin-board for news.

Please be prompt and reliable!

To teach the math lesson, you will need:

1. flashcards
2. worksheet
3. student's folder
4. a sharp pencil
5. a calculator

Please gather these materials together before your student arrives.

The lesson goes like this:

1. Teach the flashcards
2. Test the flashcards
3. Record % correct
4. Time your student on a fact worksheet
5. Record time
6. Grade the worksheet with your student
7. Use lots of praise
8. Record daily progress on your student's charts

I'm glad you're here!

Ms. Bullard

Day Two

1. Quick overview of daily lesson
    a. Flashcards
    b. Worksheets
    c. timing
    d. record-keeping (look at data sheet, charts)

2. Learn flashcard error-correction
    a. student says answer
    b. praise frequently
    c. correct - ask for answer again, then:
        "My turn"
        "Our turn"
        "Your turn"
    d. record number correct on the data sheet
    e. drill missed facts
    f. test entire set again

handouts: error correction (exhibit four)
data sheet (exhibit five)

Exhibit 4. Error Correction Procedure.

ERROR CORRECTION FOR FLASHCARDS

1. Ask your student to repeat the answer. ⟶ if correct this time,
   a. Praise,
   b. Put the card in a separate stack.

   Still incorrect?
   a. model the correct fact (say: "2 + 5 = 7")
   b. lead your student (you and the student say "2 + 5 = 7" together)
   c. test (student says "2 + 5 = 7" alone)
   d. praise
   e. put the card in a separate stack

2. Test the student on the stack of cards missed.
   Repeat step one for any errors.
   Praise!
   If no errors, be sure to point this out to your student.

3. Count the cards missed the first time through. Record % correct.

4. Mix the flashcards together and practice the entire set. Repeat step one for any errors.

Exhibit 5. Data Sheet.

Name _____ RAW DATA SHEET

Date	Set Number	Flash-Cards		Worksheet		Seconds	Rate (CFPM) (# Correct x 60 ÷ seconds)	Passed?
		# Missed	% Correct	# Correct	% Correct			

Day Three

1. Practice flashcard error correction
    a. model for group (teacher and one tutor)
    b. practice in pairs
    c. test in pairs for the teacher

2. Record new praise words. Make a ditto.

handout: data sheet

Day Four

1. Calculating % correct on flashcards
    a. record number correct/total number in set
    b. divide # correct/total #
    c. multiply by 100

2. Practice in groups.

handouts: data sheet
praise handouts made by group

Day Five

1. Timing the worksheet
    a. using a stopwatch
    b. converting minutes to seconds

2. Grading the worksheet
    a. read answers from key - slowly
    b. have student mark own paper, while tutor watches
    c. have student write problems missed on back of page
    d. record number correct on the data sheet

handouts: practice sheet for converting minutes to seconds
worksheet of facts

Day Six

1. Calculate % correct on worksheet
    a. record number correct
    b. divide number correct by total number of problems (80 on my worksheets)
    c. multiply by 100
    d. record % on data sheet

2. Calculate "correct facts per minute" (CFPM)
    a. (Number correct on worksheet x 60) ÷ the total number of seconds
    b. record under "CFPM" on data sheet

handout: data sheet with sample data

Day Seven

1. Practice calculations
    a. % correct flashcards
    b. number correct on worksheet
    c. % correct worksheet
    d. total number of seconds
    e. CFPM

handout: data sheet with sample data

Day Eight

1. Multi-Band chart
    a. overview: % flashcards
    % worksheet
    worksheet rate (CFPM)
    b. day/date lines
    c. explain graphing data points
    d. practice charting

handout: multi-band chart

Day Nine

1. Practice Charting on Multi-Band
    a. model for group (teacher)
    b. practice in pairs
    c. test for teacher

handouts: data sheets
multi-band chart

Day Ten

1. Criteria for passing a lesson
    a. accuracy on worksheet $\geq$ 96%
    b. rate $\geq$ 20 CFPM
    c. no criterion for flashcards

2. Daily progress chart
    a. explain graph
    b. dot for passing
    c. "X" for not passing

3. Student must pass 3 consecutive days on each set of facts before going to next set.

handout: daily progress chart

Day Eleven

1. Practice Daily progress chart
    a. Model for group
    b. practice in pairs
    c. test

handout: daily progress charts

Day Twelve

1. Practice entire lesson in pairs
    a. flashcards
    b. worksheet (timed)
    c. calculations
    d. charting on multi-band
    e. charting daily progress

handouts: worksheet
data sheet
charts

Day Thirteen

1. Test entire lesson
2. Review weak spots

Day Fourteen

1. Test entire lesson

The Tutoring Sessions

Ten tutor pairs completed at least four weeks of instruction. Of these, the average number of days worked per week was 3.7. Four children were tutored five days a week, and the others were seen two to three times per week. Except for absences, each student was always seen for the same number of days per week. The tutoring was always done from 9:00 to 9:30 in the morning under the supervision of the resource teacher. The lesson took approximately twenty minutes, and the tutors spent the last ten minutes computing and recording daily data on the students' charts. After each day's lesson, the student was allowed to color one space on a coloring book picture posted in the resource room.

The lesson consisted of flashcard drill followed by a timed written worksheet of eighty problems. The addition and subtraction facts were divided into eighteen sets beginning with the addition and then subtraction facts 0-3 and continuing through addition and subtraction facts 14-19. Thus, addition and subtraction facts were learned alternately. Each student worked on those fact sets which he/she had failed to learn in the regular class. Students were required to master each worksheet on three consecutive days before going on to the next set of facts. Criteria for mastery was 93% accuracy and twenty CFPM. When a student scored substantially above criteria (usually 100%, with >30 CFPM) on the first two days of a new set of facts, he was allowed to skip to the next set on the third day.

Reliability

Tutors were evaluated during training and required to demonstrate 100% accuracy on nine skills before they were given a license to tutor (exhibit six). Each tutor was again observed on a variable schedule throughout the program at least three times by the resource teacher. Average reliability on

seven skills for all tutors was 95%, ranging from 88% to 98%. The tutors averaged 92% reliability on error correction, ranging from 80% to 100%. Reliability in charting was 91%, ranging from 67% to 100%. Tutors were observed to use praise in 96% of the lessons. One tutor used praise in only 75% of the sessions; all of the other tutors were using praise in 100% of their sessions. Reliability on grading the worksheets and calculating percentage on both flashcards and the worksheets was 100%. Rate was calculated by the tutors with 93% reliability, ranging from 75% to 100%.

FAIRVIEW SUPER-TUTOR LICENSE

School year _____ to _____

This is to certify that _____ has successfully completed the official Fairview School Super-Tutor training program which began on _____ and continued every day through _____

_____ has mastered the following:

_____ counting errors
_____ correcting errors
_____ calculating % correct
_____ reading a digital stopwatch
_____ using praise
_____ converting minutes to seconds
_____ calculating CWPM
_____ multi-band chart
_____ daily progress chart

and has parental permission to participate in the tutoring program.

certified by:

_____

_____

CONGRATULATIONS!

Exhibit 6. Tutor License.

Results

Using the data recorded by the tutors under the resource teacher's supervision, we were able to determine the number of sets mastered by each child and the average number of sessions required to master a set of facts (Table 1). As a group, the students mastered an average of 9.1 sets of facts, ranging from five sets to fifteen sets. The average number of sessions required to master a single set was 4.6, with a range from 1.8 sessions per set to 8.3 sessions per set. The two students labeled LD mastered 12 and 15 sets of facts but required 8.3 and 6.1 sessions/set for mastery.

TABLE 1

Results of Peer Tutoring Program

Tutor Pair	Tutor's Grade Level	Tutee's Grade Level	Number of Sessions	Number of Sets Mastered	Average Sessions Required to Master Each Set
A	5	4	16	9	1.8
B	4	2	24	6	4.0
C	6	4	21	9	2.3
D	4	1	46	6	7.7
E	6	4	91	15	6.1
F	6	2	13	5	2.6
G	6	4	100	12	8.3
H	5	2	27	10	2.7
I	3	2	53	10	5.3
J	6	4	44	9	4.9
Average	5.6	2.9	43.5	9.1	4.6

At the conclusion of the study, the students were asked to answer ten questions about the tutoring, and their answers indicated very positive attitudes toward their own abilities and also toward their tutors and the experiences of being tutored.

All students reported being happy when they passed a set of facts. The average answer on a scale of 1-7, with 7 being "very happy", was 6.9. The lowest rating was a 6. Students did not consistently say that the work was "easy." The average answer (4.3) was only slightly closer to "easy" (7) than to "hard" (1). Answers ranged from 1-7. Even so, when asked if they would like to be tutored again, students answered from "wouldn't mind" (4) to "love it" (7). The average was 5.4. All students said that they knew their facts better than before being tutored. The average for this question was 6.7, with 7 representing "much better."

Tutors also made positive comments about their part in the study. 92% of the tutors gave tutoring the highest possible rating on a scale from 1 ("not fun") to 7 ("fun"). One student chose a rating of 6.

All tutors felt that they had helped their students. Answers to this question ranged from 5-7, with 7 being "very much", and the average answer was 6.6.

The skills used in tutoring were rated as being fairly easy to learn. 25% of the group gave the skills a rating of 4 (midpoint between "very easy" and "very hard"), and the average answer was 5.9. The skills receiving the lowest (most difficult) ratings were error correction and using praise.

All tutors reported that they both liked and were liked by their students. When asked if they would tutor again, 100% said yes. All of the tutors also said that tutoring had helped them in some way. The average answer to this question on a scale from 1 ("not at all") to 7 ("very much") was 6.2. Tutors specifically

mentioned the friends made through tutoring, the skills they learned, "feeling like a big sister", understanding graphs and percentages, "learning to be responsible", and the fun of "helping someone learn new things."

Conclusions

The Fairview Super Tutor Program was successful in several ways. First, the program enabled "slow learners" and "LD" labeled children to master math facts which they had not previously managed to learn. The one-to-one instruction gave them more opportunity to practice and more immediate correction of their errors than is possible in a classroom of twenty-five to thirty children and one teacher. It also increased the amount of time on task, by forcing the students to attend. Another possible explanation for the program's success is simply that it was fun. The children responded to the praise they received from their tutors and from the teacher, and they also enjoyed the other reinforcers such as stickers and coloring sheets. But the students' success seemed to be the most effective reinforcer. In the regular classroom, many of the students seldom earned scores as high as 93% in mathematics, and none had previously succeeded in memorizing the math facts. The findings supported the first hypothesis: students receiving peer-tutoring would perform written math facts as quickly and accurately as their age-mates.

Second, although our findings suggest that students labeled "L.D." are able to master math facts as successfully as non-labeled children, the data is inadequate to make a definitive conclusion. We had hoped to include an equal number of students from each group, but because of scheduling conflicts only two labeled children participated. Both of them mastered the facts at the same criteria level as the other students in the study, only at a slightly lower average rate.

Third, all students who were tutored apparently developed more positive attitudes about their ability to succeed in school. Although they thought mastering facts was relatively difficult, they enjoyed the challenge and were proud of their accomplishments. Receiving frequent praise and individual attention minimized the frustration they may have felt when struggling with facts. Also, knowing the precise criteria for the daily task enabled them to experience a sense of control over the math problems which did not exist when they faced the lengthy Friday facts test in the regular classroom. The controlled practice and daily testing with a tutor built their confidence. Seeing their charts climb toward their goals further strengthened their belief in their ability to succeed.

In addition to the findings noted above, two unanticipated consequences were discovered in evaluating the Fairview tutoring program. Warm relationships developed between tutor and student and remained strong outside the classroom. Both tutors and students also noted on the end of year survey that they enjoyed the mutual friendships.

The other major finding was the effect of the program on the tutors. In addition to learning new cognitive skills required to calculate CFPM, determine percentages, and chart a student's progress, the tutors also learned some non-cognitive interpersonal skills.

Within two months, both of the tutors previously identified as having behavior problems exhibited major changes. Both made friends with the students they tutored and began spending time with them outside the class. They also seemed to enjoy being a member of the group of tutors and began developing friendships with other classmates. Inappropriate behaviors, such as lying, arguing, and belittling classmates also decreased.

The other tutors also became more involved in school. Their teachers reported that they participated more and were more willing to use their abilities to help other students. They discovered the importance of responsibility and cooperation.

To summarize, data recorded by the tutors demonstrates that peer tutoring was an effective technique for teaching these ten students a skill which they had not mastered through traditional methods including whole class instruction and home flashcard drill. Both LD labeled and non-labeled regular class students consistently performed at or above mastery level criteria.

Because both tutor and student were required to contribute to the relationship, the program was also a successful intervention in the affective domain. Tutors had to be punctual, responsible, and full of praise. Students were expected to stay on task and try to do their best. The mutual sharing of responsibility built a strong bond and apparently improved the self-esteem of both tutors and tutees. Most significant, both the cognitive and affective gains seen in the tutoring setting were also reported by the regular classroom teachers, indicating that the Fairview Super-Tutor program was a true success.

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